Executive Summary
for

Hydraulic & Hydrological Analysis
for

I-75 Reversible Lanes
over
Elizabeth Branch Culvert

Project Number: NH000-0073-03(242)
P.I. No. 714130

November 2009

Prepared by

PBS&J

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Atlanta, GA 30328

for
Georgia Transportation Partners
Atlanta, Georgia

Executive Summary

The purpose of this summary is to verify that the I-75 Reversible Lanes crossing over the culvert at I-75 and Elizabeth Branch has no adverse impacts to the base floodplain and floodway. Information related to this crossing is detailed below.

Project Location and Description

The crossing of the I-75 Reversible Lanes over Elizabeth Branch is located in the city of Marietta, Cobb County, Georgia. The proposed new alignment consists of a single span structure over the existing I-75 culvert at Elizabeth Branch. The proposed alignment is located on the west side of I-75, just adjacent to the existing I-75 edge of shoulder and is within a designated regulatory floodway. The proposed alignment crossing occurs in an area that is heavily vegetated with large specimen trees and dense underbrush. While there is no development within the immediate floodplain, there is a detention pond and commercial buildings located in the upstream floodplain approximately 100 ft west of the proposed alignment. Roadway embankment fill contained within MSE walls will be placed on either side of the existing culvert with vertical abutment walls supporting the proposed structure. This roadway section is within the floodplain.

Proposed Condition

The proposed structure is to be a 50'-0" long by 39'-3" wide, out-to-out, PSC beam bridge with MSE wall abutments. End bents are positioned at 90 degrees to the roadway centerline. The proposed bridge will be 36'-0" wide gutter to gutter and consists of two 12'-0" travel lanes with a 2'-0" inside shoulder and 10'-0" outside shoulder. The minimum low chord elevation is 1064.84 feet and the minimum roadway elevation is 1067.84 feet. The proposed structure is the minimum length required to provide a "No-Rise" condition, however a 76'-0" long structure would be required to span the existing floodway.

Proposed Alternatives

A bottomless culvert alternate was considered for this site. The proposed alternate was modeled as a 50' span unit with a 12' rise on a 3' vertical wall (crown @ 15'). The proposed alternate is the

minimum length required to provide a "No-Rise" condition

Method of Analysis for Proposed Bridge & Alternate

Requirements and guidelines contained in the Georgia Department of Transportation's (GDOT) Drainage Design Manual, Chapters 2 & 14, were used in the preparation of this report. Cross-sectional information was derived from the Federal Emergency Management Agency (FEMA) data (HEC-2), supplemented with a field survey provided by PBS&J. Modeling and hydraulic analysis was performed with the HEC-RAS (Version 3.1.3, May 2005) program using the energy bridge modeling method for the proposed structure. The downstream boundary conditions were set as the normal depth using the hydraulic slope derived from USGS Quadrangle Topographical maps.

The drainage basin at the proposed crossing is approximately 678.4 acres (1.06 sq. mi.) and was measured from the USGS Quadrangle Topographical maps for Marietta and Sandy Springs, Georgia, in combination with FEMA data. The drainage area for this project site is located in Region 1. Discharges for the 10, 50, 100, and 500-year storms are detailed in the FEMA Summary of Discharges data which can be found in the following pages.

Manning "n" values were specified as 0.045 in the channel and 0.120 in the overbank areas and are based on the site assessment which agrees with FEMA data.

There is no design year ADT available for this site. However, per GDOT guidelines for an interstate this site has been designed to accommodate the 50-year storm and provide a minimum of 2 foot of freeboard. Also, the site must provide a minimum of 1 foot of freeboard above the 100-yr storm. This criteria was met or exceeded.

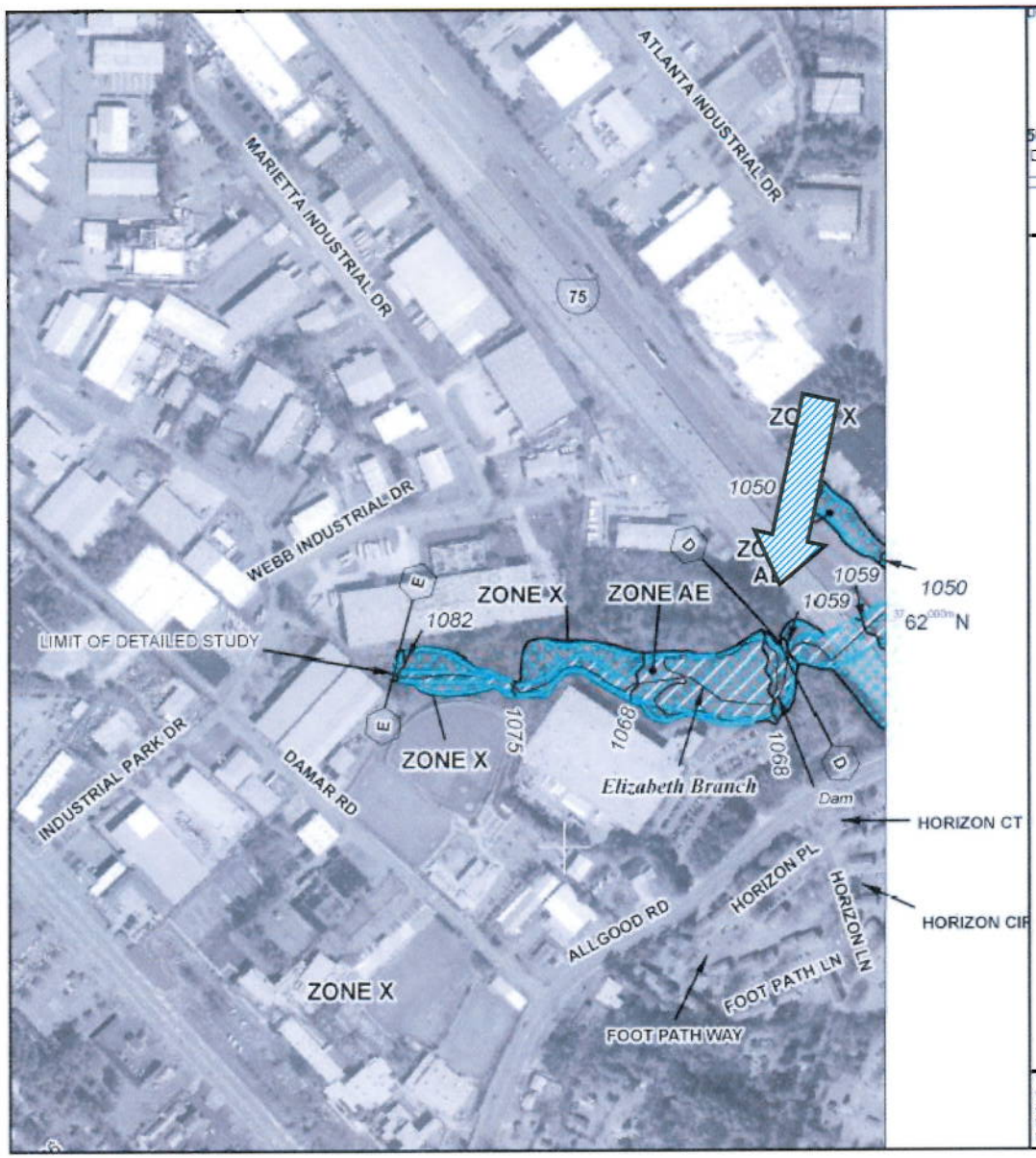
FEMA Participation

This site is located in the City of Marietta, Cobb County, Georgia. Since this community participates in the National Flood Insurance Program (NFIP) administered by the Federal Emergency Management Agency (FEMA), all NFIP regulations apply. In particular, the NFIP regulation 60.3(d)(3), states that the community shall:

"Prohibit encroachments, including fill, new construction, substantial improvements, and other development within

the adopted regulatory floodway unless it has been demonstrated through hydrologic and hydraulic analysis performed in accordance with standard engineering practice that the proposed encroachment would not result in any increase in flood levels within the community during the occurrence of the base flood discharge..."

Elizabeth Branch has been previously studied by FEMA, and at the proposed crossing is designated as a Zone AE flood area. This site is also within a designated floodway and modeling was performed to provide a "No-Rise" condition. GDOT defines a "No-Rise" project as one that causes no change in the base flood profile or the floodway profile rounded to the nearest 0.1 foot or in floodway width rounded to the nearest 1 foot for any cross section outside GDOT right-of-way. Per FEMA guidelines, community coordination is required for this site. If necessary, a "No-Rise" certification and supporting documentation can be provided.



Donal Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

50 0 500 1000

FEET

METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0106G

FIRM

FLOOD INSURANCE RATE MAP

COBB COUNTY, GEORGIA
AND INCORPORATED AREAS

PANEL 106 OF 252

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS

COMMUNITY	NUMBER	PANEL	SUFFIX
COBB COUNTY	130052	0106	G
MARIETTA, CITY OF	130236	0106	G

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
13067C0106G

MAP REVISED
DECEMBER 16, 2008

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

TABLE 2 - SUMMARY OF DISCHARGES - continued

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cubic feet per second) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance		0.2-Percent-Annual-Chance
				Existing	Future	
DUE WEST CREEK						
At confluence with Allatoona Creek	3.40	1,494	2,542	3,010	3,665	4,153
At Acworth Due West Road	3.08	1,534	2,599	3,066	3,723	4,176
At Paul Samuel Road Southwest	2.40	1,458	2,509	2,928	3,541	3,940
EASTSIDE CREEK						
Just upstream of Indian Hills Golf Cart Path	0.40	359	961	1,117	1,087	1,550
At Clubland Drive	0.27	571	898	1,044	1,077	1,410
ELIZABETH BRANCH						
Approximately 640 feet downstream of Allgood Road Northeast	1.18	1,986	2,981	3,364	3,428	4,359
Approximately 170 feet upstream of U.S. Interstate 75/ State Highway 401	0.81	1,797	2,489	2,770	2,770	3,448
FAVOR CREEK						
At confluence with Nickajack Creek	1.42	1,320	2,170	2,520	2,580	3,350
At Church Road	1.26	1,250	2,070	2,420	2480	3,240
At Smyrna-Powder Springs Road Southwest	0.85	1,060	1,590	1,830	1,880	2,410
FLORENCE BRANCH						
At confluence with Powder Springs Creek	4.50	1,109	1,770	2,064	*	2,845
At Shipp Road Southwest	3.50	958	1,530	1,789	*	2,469

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Due West Creek (continued)								
M	12,096[1]	65	128	6.5	966.2	966.2	966.2	0.0
N	12,746[1]	30	126	6.4	977.4	977.4	977.7	0.3
O	13,447[1]	30	122	6.6	988.1	988.1	988.4	0.3
Eastside Creek								
A	1,178[2]	30	154	6.0	920.3	915.3[4]	915.3	0.0
B	1,731[2]	190	2,036	0.5	929.3	929.3	929.4	0.1
C	3,959[2]	40	118	8.8	941.1	941.1	941.3	0.2
D	4,793[2]	24	93	11.2	948.9	948.9	948.9	0.0
Elizabeth Branch								
A	1,209[2]	220	746	4.5	1,008.7	1,008.7	1,009.2	0.5
B	2,402[2]	76	614	4.5	1,023.3	1,023.3	1,023.6	0.3
C	3,650[2]	129	709	3.9	1,035.8	1,035.8	1,036.2	0.4
D	4,718[2]	76	385	1.7	1,059.0	1,059.0	1,059.0	0.0
E	6,238[2]	32	82	8.1	1,081.7	1,081.7	1,081.8	0.1
Favor Creek								
A	890[3]	264	885	2.9	916.6	910.5[5]	911.2	0.7
B	1,787[3]	39	204	11.9	916.6	916.0	916.2	0.2
C	3,503[3]	272	1,343	1.8	940.1	940.1	941.0	0.9
D	5,347[3]	107	464	3.3	948.7	948.7	949.7	1.0
E	6,565[3]	78	364	4.2	958.6	958.6	959.5	0.9
F	7,554[4]	21	109	9.8	977.1	977.1	977.7	0.6

[1]Feet above confluence with Allatoona Creek
[2]Feet above confluence with Sope Creek
[3]Feet above confluence with Nickajack Creek
[4]Elevation computed without consideration of backwater from Sope Creek
[5]Elevation computed without consideration of backwater effects from Nickajack Creek

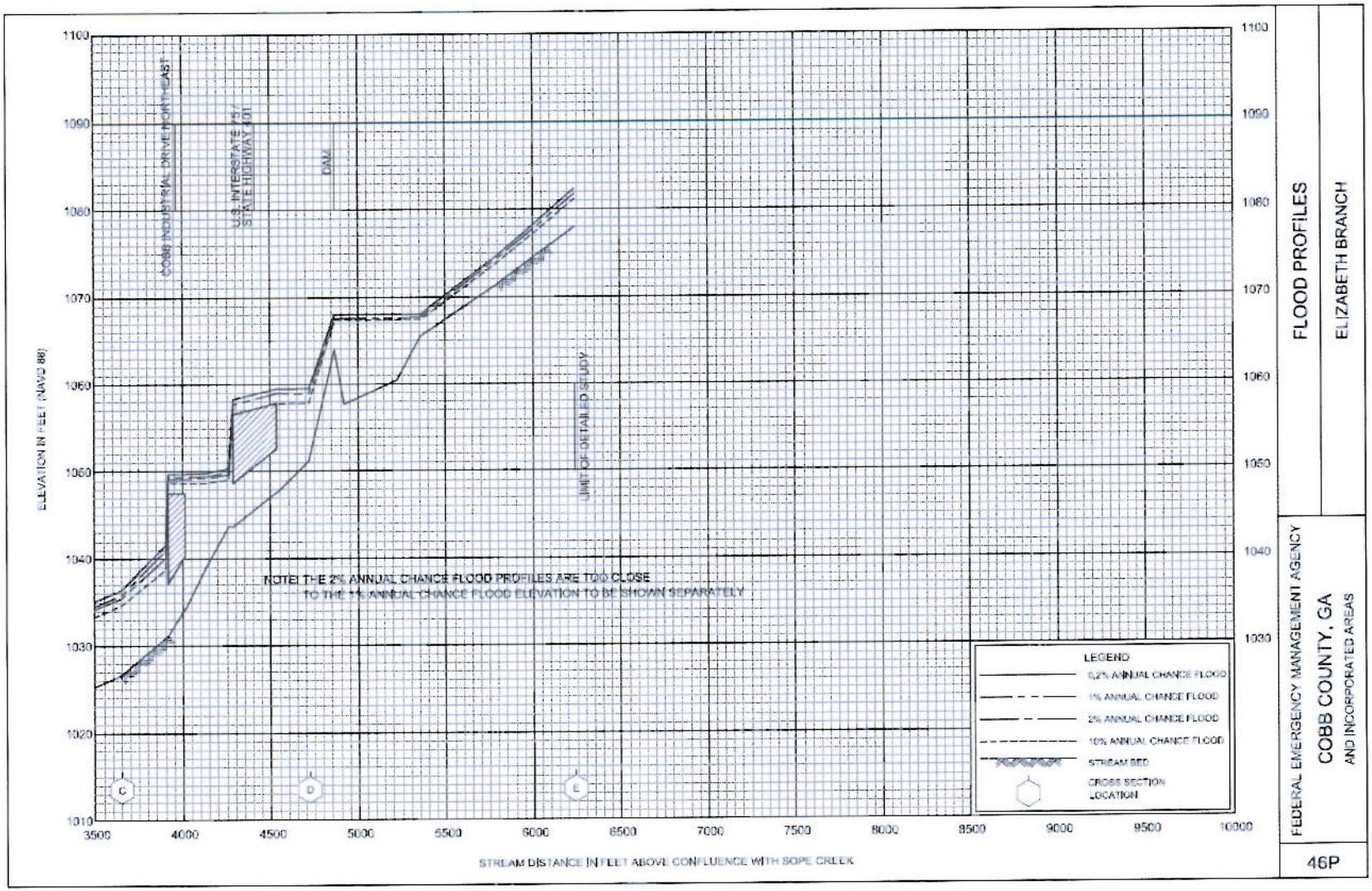
TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

COBB COUNTY, GA AND INCORPORATED AREAS

FLOODWAY DATA

DUE WEST CREEK – EASTSIDE CREEK – ELIZABETH BRANCH –FAVOR CREEK



FLOOD PROFILES

ELIZABETH BRANCH

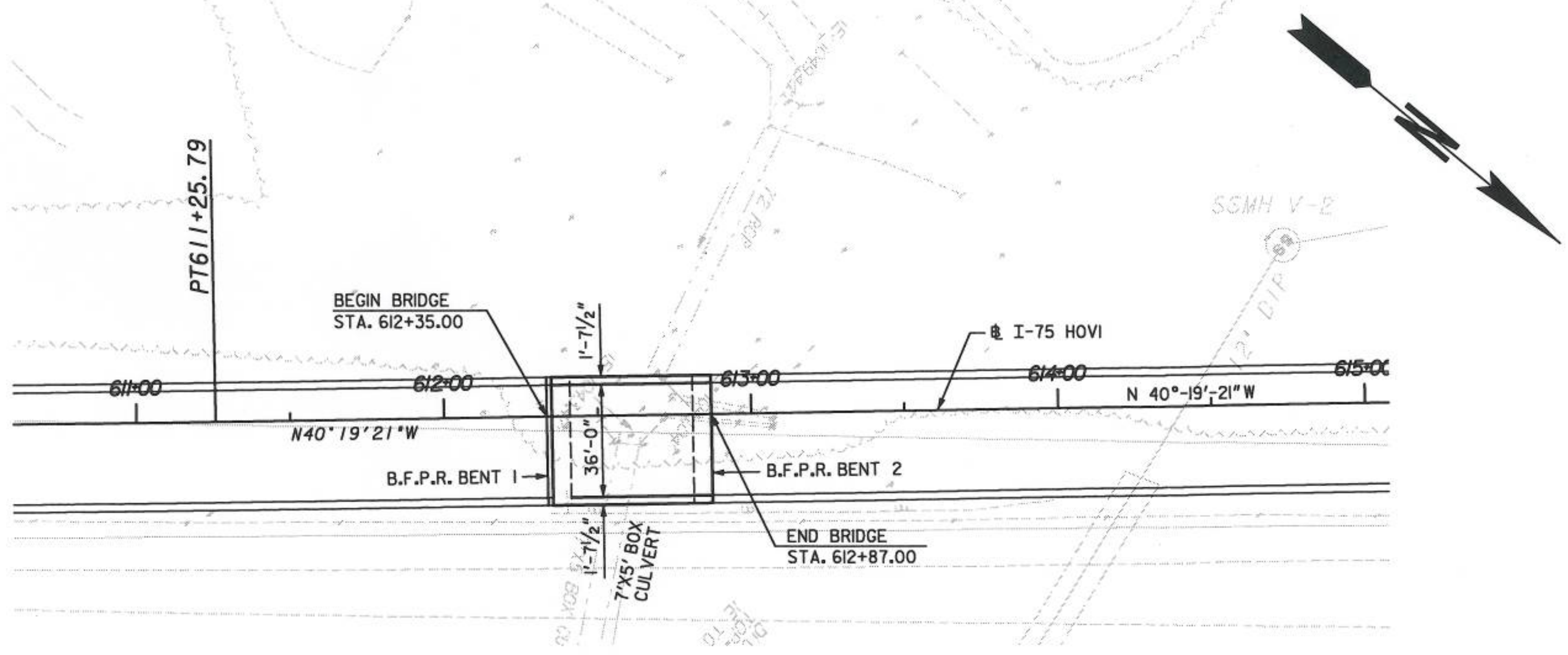
FEDERAL EMERGENCY MANAGEMENT AGENCY

COBB COUNTY, GA

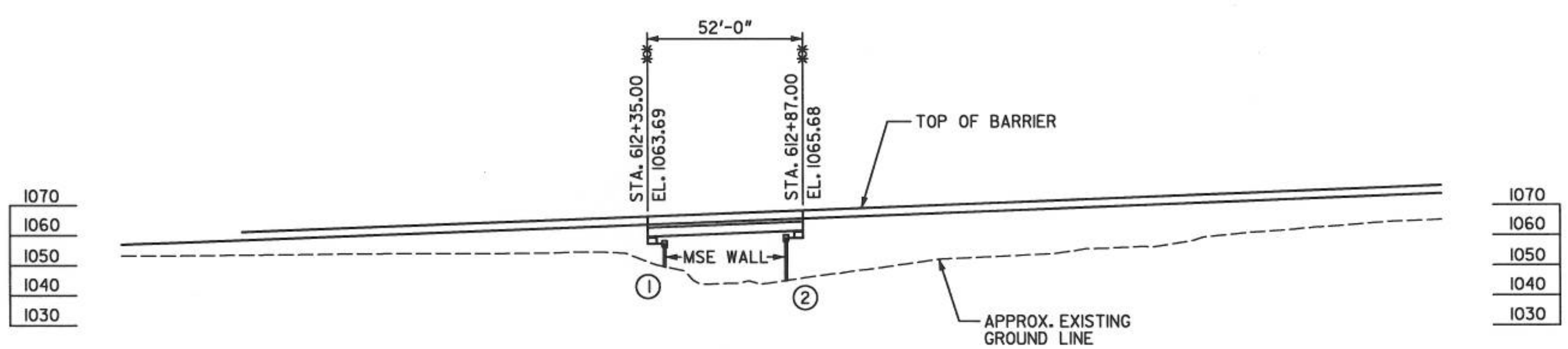
AND INCORPORATED AREAS

46P

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA	NH000-0073-03(242)		



PLAN



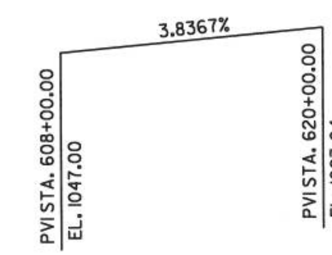
ELEVATION

NOTES:

** STATIONS AND ELEVATIONS ARE ALONG ℄ I-75 AT THE INTERSECTION OF ℄ I-75 WITH B.F.P.R. OR ℄ BENT.

END BENTS ARE RADIAL.

END BENT PILES NOT SHOWN.



GRADE DATA
℄ I-75 HOVI

P&E to bigger scale

Hydraulic Data

etc

DESIGN DATA

SPECIFICATIONS ------------------------------------ AASHTO 17TH EDITION, 2002
(DESIGNED FOR SEISMIC PERFORMANCE CATEGORY A)

TYPICAL HS20-44 AND/OR MILITARY LOADING ---------------------- IMPACT ALLOWED

FUTURE PAVING ALLOWANCE ------------------------------------ 30 LBS PER SQ FT

BRIDGE CONSISTS OF

2 - STEEL H PILE END BENTS -------------------------------- SPECIAL DESIGN

1 - 52'-0" TYPE II PSC BEAM SPAN ---------------------------- SPECIAL DESIGN

PROJECT P.I. NO. 714130

BRIDGE NO. 24A

		REVISIONS					
NO	DATE	DESCRIPTION	ORIG	CHKR	SUPV	APPR
A	11-30-09	ISSUED FOR HYDROLOGY SUBMISSION	CAB	FAQ	BLB	BLB

CAB/DRB (DRAWN BY)	11-30-09 (DATE)
FAQ (CHECKED BY)	11-30-09 (DATE)
BLB (SUPERVISOR)	11-30-09 (DATE)
BLB (APPROVED)	11-30-09 (DATE)

GEORGIA TRANSPORTATION PARTNERS

SCALE IN FEET
0 30 60 120

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

PBS&J

BRIDGE SHEET 1 OF 3

I-75 / I-575 NORTHWEST CORRIDOR

I-75 REV. AT ELIZABETH BRANCH
STA. 612+35 TO STA. 612+87

COBB COUNTY NH000-0073-03(242)

DRAWING No. 35-151

REF. FILES:

O:\I75\Bridges\PBSAJ\Br24A (Elizabeth)\pe_l.dgn
pe_l.dgn 12/1/2009 8:08:24 AM